is covered, it is free from malaria.—On the minute anatomy of the central nervous organs, by Prof. C. Golgi.—On periodic and superfluous respirations, by Prof. A. Mosso (eight plates).—The respiratory movements in health are not always uniform in sleep and during moments of deep repose; the respiratory effort decreases and augments. This peculiar form the author calls "periodic respiration," and any excess of respiration beyond the actual needs of the tissues and blood he calls "superfluous respiration." Many phenomena of interest are described in this memoir.—Contribution to a knowledge of the physiological effects of cocaine, by Dr. C. Sighicelli.—On the physiological action of thalline, by Dr. G. Pisenti.

Schriften der Naturforschenden Gesellschaft in Danzig, Band vi. Heft 3 (1886).—We note here a copiously-illustrated account by Drs. Lissauer and Conwentz of the various antiquities which have been found in the Vistula-Nogat delta, ranging from the Neolithic period to Roman times; also a curious collection, by Herr Triechel, of sayings of the country folk in West Prussia, about plants.—Herr Helm and Herr Brischke report on insects found in amber.—The remaining matter largely relates to local botany.

Bulletin de l'Académie Royale de Belgique, February.—Application of the telephone to the discovery of faults in electric lines, by Eric Gerard. A new and ingenious method is described for determining by means of the telephone the spot where an underground telegraph line presents any accidental solution of continuity without the necessity of opening the ground and exposing the section of the wire where the break is suspected to exist. Owing to its extreme sensitiveness, the telephone communicates all signals transmitted by the underground conductor during the examination; but when the fault is reached, it remains silent, thus indicating the spot where search should be made for the defect. The method may be made applicable to submarine cables.—Earth microbes and their action in stimulating the growth of the higher vegetable species, by E. Laurent. In order to ascertain how far these micro-organisms are necessary to the life of the plant, the author has recently made some experiments: (1) in natural soil; (2) in soil first sterilised and then inoculated with microbes taken from the natural soil; (3) with soil rendered absolutely sterile; (4) with sterilised soil to which mineral manures were afterwards added. These experiments clearly showed the importance of the microbes, whose functions would seem to be identical with those of nitrification. They seem to prepare the needed inorganic food of the plant by decomposing the organic matter present in the ground.—On the influence of lunar attraction on the mercurial barometer, by J. Liagre. This was in reply to some remarks of M. Folie, who questioned the author's statement that atmospheric tides cannot be determined by the mercurial barometer. He repeats that lunar attraction cannot be appealed to in order to explain M. Folie's law that atmospheric pressure is lowest when the oceanic tides are highest.—A simple and practical method of determining the magnetic declination of any place whose meridian is unknown, by F. Folie. It is shown that the difficult and troublesome process of fixing the meridian may be dispensed with by employing a method based on the simple fact that, when the height of a star is equal to its declination, taken with its sign or opposite sign according as it is in the northern or southern hemisphere, its azimuth is the supplement of its horary angle, or else is equal to this angle itself.—Notice of some geological specimens from the islands of Cebu and Melanipa (Philippines), by A. F. Renard. A study of these specimens, collected by Mr. Buchanan in 1874, seems to show that to Cebu and Melanipa may also be extended the interpretation already admitted for the larger islands of the archipelago regarding the schisto-crystalline character of the underlying rocks, and the presence of eruptive rocks of the archæan type.—The same author contributed two other valuable papers on the geological constitution of the Ternate volcano and of Mount Gûnong-Api, in the Banda Archipelago.

Rendiconti del Reale Istituto Lombardo, March 4-18.—Positivism and evolution, by Prof. A. Buccellati. It is argued that Comte's theological, metaphysical, and positive cycle may perhaps represent the general sequence of mental evolution, but cannot be accepted in a strictly chronological sense. It confines the human mind in too narrow limits, and it must be obvious that all three phases of thought have been simultaneously at work in varying degrees of intensity at all times. Such an exclusive succession is illogical, and opposed alike to history and to the very constitution of the mind, which passes readily and unconsciously from analytic observation to synthesis, and from the inductive to the deductive method.—On the systems of surfaces and their rectangular trajectories, by G. Morera.—Meteorological observations made at the Brera Observatory, Milan, during the month of February.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 25.—"On the Minute Anatomy of the Brachial Plexus." By W. P. Herringham.

Dr. Herringham had traced by dissection the fibres of the several nerve roots from the spinal cord through the net of the plexus into the various nerves given off from this, and down these nerves to their final destination, whether motor or sensory. He found—

(1) That any given fibre may alter its position relative to the vertebral column, but will maintain its position relative to other fibres.

(2) That, in the motor nerves, (*a*) of two muscles, or of two parts of a muscle, that which is nearer the head end of the body tends to be supplied by the higher, that which is nearer the tail end by the lower nerve; (*b*) of two muscles that which is nearer the long axis of the body tends to be supplied by the higher, that which is nearer the periphery by the lower nerve; (*c*) of two muscles that which is nearer the surface tends to be supplied by the higher, that which is further from it by the lower nerve.

(3) That, in the sensory system, (*a*) of two spots on the skin that which is nearer the pre-axial border tends to be supplied by the higher nerve; (*b*) of two spots in the pre-axial area the lower tends to be supplied by the lower nerve, and of two spots in the post-axial area the lower tends to be supplied by the higher nerve.

A table was also given of the muscles classified according to the spinal root which supplied them. The paper was based on fifty-five dissections.

Physical Society, April 10.—Prof. Balfour Stewart, President, in the chair.—The following communications were read:—On the cause of the solar diurnal variations of terrestrial magnetism, by Prof. Balfour Stewart, LL.D., F.R.S. The author commenced by reviewing various theories that have been advanced to account for the solar diurnal inequalities of terrestrial magnetism. That they can be due to the direct magnetic action of the sun is highly improbable, since terrestrial analogies would lead us to infer that matter at the temperature of the sun is quite incapable of possessing magnetic properties, and also from the fact that changes in the range of the daily variation lag behind corresponding solar changes in point of time. The hypothesis of Faraday, that the observed variations are the result of the displacement of the magnetic lines of force due to the varying temperature, and consequently varying magnetic permeability, of the atmospheric oxygen, is disproved by the fact that there is no agreement between the chief magnetic variations and those of the temperature of the great mass of the atmosphere, though it is certain that there must be some effect due to this. The earth-current hypothesis is quite unable to explain one of the chief characteristics of these variations, that they are half as great again at periods of maximum as at those of minimum sunspot frequency. Sir George Airy has, moreover, been unable to detect any resemblance in form between the regular diurnal progress of the magnet and that of earth-currents. We seem, therefore, compelled to seek for the cause of the variations in the upper atmospheric regions, and we cannot imagine such a cause to exist in any other form than that of a system of electrical currents. That curents may, and actually do, exist at great heights is shown by the aurora, which is unquestionably an electric current, and manifests a close connection with the phenomena of terrestrial magnetism. The great increase of magnetic variation at epochs of maximum sunspot frequency can also be accounted for on this supposition: Prof. Stokes has remarked that an increase in the radiating power of the sun would probably imply not only an increase in general radiation, but a special and predominant increase in such actinic rays as are probably absorbed in the upper regions of the earth's atmosphere. These regions will, therefore, greedily absorb the new rays, their temperature will rise, and, as is known to be the case for gases, the electrical conductivity will be increased.

Thus, even if we imagine the general atmospheric current to remain constant, a greater proportion of it would be thrown at such times into those heated portions which had become good conductors, but it is also probable that the current itself would be increased. Assuming the existence of currents at great altitudes, the regularity and general characteristics of the diurnal variations would seem to point to a direct magnetic action of the currents rather than to any general induced change in the magnetic system of the earth, which, to produce the observed results, would have to be of a very artificial character. The diurnal variation of the declination, attaining a westerly maximum at 2 p.m. north of the equator, and an easterly maximum at the same time south of it, would suggest the existence of currents flowing northward and southward from the equator to the poles, attaining a maximum in each hemisphere about two hours after the sun had passed the meridian. To supply this flow we should probably have to assume the existence of vertical currents ascending from the equatorial regions of the earth. At this point Dr. Schuster has endeavoured to apply mathematical analysis to the subject. From the recorded observations at Greenwich, Lisbon, Hobarton, St. Helena, and the Cape, he has shown that the work done by a magnetic pole describing a closed path in a horizontal plane at those places is equal to the work done upon it, and consequently no part of the ascending current can be inclosed by the path. Hence the potential at those places obeys the law expressed by the equation—

$$\frac{d^2V}{dx^2} + \frac{d^2V}{dy^2} + \frac{d^2V}{dz^2} = 0.$$

From this Dr. Schuster has deduced two possible expressions for the potential, one referring to a system of currents above our heads, and the other to one beneath our feet. From the first of these expressions it follows that for latitudes greater than 45° the maximum of horizontal force should coincide with the minimum of vertical force, and *vice versâ*, and this is actually the case at Greenwich; while the opposite should hold if the influencing system were beneath us. For latitudes below 45° the reverse of the above should be the case, and the observations at Bombay, though less decided than those at Greenwich, would seem to point the same way. On the whole, then, it must be said that the results of the first attempt are very encouraging, and point to the supposition that the greater part of the disturbing cause lies outside the earth's surface. In a discussion that followed, Mr. Whipple remarked that recent observations in high latitudes seem to show that the aurora is not always at such a great height as is usually supposed. Prof. A. W. Rücker cited the well-known case when an observer saw what appeared to be a meteor fall into the sun, while simultaneously, or nearly so, there was recorded a magnetic disturbance on the earth, as showing a direct solar action. Mr. Whipple, however, stated that he had recently examined this point, and believes that the very slight notch in the record, many similar to which have occurred since, was of an accidental nature, and a mere coincidence. Prof. McLeod suggested that the earth-current theory might be tested by observations at the bottom of a mine, where, according to the theory, the disturbances should be reversed. Prof. Adams believed that there was nothing physically impossible in the existence of such currents as the author imagined.—*On a relation between the critical temperatures of bodies, and their thermal expansions as liquids*, by Prof. A. W. Rücker, F.R.S., and Prof. T. E. Thorpe, Ph.D., F.R.S. A paper by the authors bearing the above title was published in the *Journal* of the Chemical Society of London for April 1884. The substance of the paper was as follows. Prof. Mendeléeff has shown that the expansion of liquids under constant pressure between 0° C. and their boiling-points may be expressed by means of the very simple formula—

$$V_t = \frac{1}{1 - kt},$$

V_t being the volume at $t°$ C. (that at 0° C. being unity), and k a quantity which differs for different substances, but which may for any one substance be considered invariable between 0° C. and the neighbourhood of the boiling-point. From this law the authors have obtained as a deduction the following expression for the critical temperature (T_c) of any liquid—

$$T_c = \frac{TV_t - 273}{a(V_t - 1)},$$

where V_t is the volume at $t°$ C., T the absolute temperature, and a a quantity which is very nearly constant for all substances, and which was shown to be very nearly 2.—In a recent paper (*Ann. Ch. Ph*, March 1886) MM. A. Bartoli and E. Stracciati have discussed both of these formulæ, and have applied them to cases in a manner never intended by the authors. They have expanded Mendeléeff's formula into the series

$$V_t = 1 + kt + k^2t^2 + k^3t^3 + \ldots .$$

which is a geometrical progression, and they have objected to it that the results of Pierre, Kopp, Hirn, Thorpe, &c., do not give for the coefficients of t, t^2, t^3, quantities in geometrical progression. The results of these observers are given in the usual form—

$$V_t = 1 + at + bt^2 + ct^3 + \ldots .$$

but, owing to unavoidable errors of experiment, the constants c, d . . . of different observers differ very largely, and Mendeléeff's simple expression gives the results of all quite as accurately as the facts will allow. MM. Bartoli and Stracciati have then criticised the expression given by the authors, and have applied it to determine the critical temperature of water from its expansion to 200°, whereas the original expression is only given as applicable as far as the boiling-point. They have further recorded a number of critical temperatures calculated by the formula to tenths of a degree, for which the constant a would require to be known to ·025 per cent., whereas there is no reason for supposing it known to within 1 per cent. or more.

Zoological Society, April 6.—Prof. W. H. Flower, F.R.S., President, in the chair.—The Secretary exhibited, on behalf of Mr. J. B. Martin, F.Z.S., a large tusk of the Indian Elephant (*Elephas indicus*), about 6 feet long and weighing over 100 lbs., stated to have belonged to a "rogue elephant," with only one tusk, which had been killed at Goruckpore in 1836.—Mr. Sclater exhibited the heads and horns of two species of Antelopes obtained in the vicinity of Lamoo, East Africa, belonging respectively to *Strepsiceros imberbis* and *Damalis senegalensis*.—Mr. F. E. Beddard read a paper on some points in the anatomy of *Chauna chavaria*.—Prof. Flower communicated a paper, by Miss Agnes Crane, on a Brachiopod of the genus Atretia, from Port Stephen, Australia, described in manuscript by the late Dr. T. Davidson, and proposed to be called *Atretia brazieri*.—Mr. J. G. Goodchild, H.M. Geological Survey, read a paper on the disposition of the cubital coverts in birds. This communication described the principal modes of imbrication of the cubital coverts, as observed in healthy living birds of all the leading carinate forms, and pointed out that there is a certain correlation between particular styles of imbrication and various other characteristics connected with the pterolysis, the myology, the visceral anatomy, and osteology of the birds in question. The paper concluded with some observations upon the origin of the features described.—A communication was read from Dr. Günther, F.R.S., containing some further information on the melanotic variety of the South African Leopard which he had previously described.

Geological Society, April 7.—Prof. J. W. Judd, F.R.S., President, in the chair.—Edward George Aldridge, Charles Brownridge, James Dennant, Charles Lane, Prof. H. Carrill Lewis, and William Matthews were elected Fellows of the Society.—The following communications were read:—On glacial shell-beds in British Columbia, by G. W. Lamplugh. Communicated by Clement Reid, F.G.S. This paper was divided into two parts, relating respectively to Vancouver Island and the Fraser Valley. Having to spend nearly a month at the city of Victoria in 1884, the author had leisure for the investigation of the geological features of the district, but he expressed his regret that, at the time, he was unacquainted with the publications of Mr. Bauerman and Dr. Dawson on the subject. The most important shell-beds were disclosed in an excavation for a dry dock at Esquimault, V.I. Here a fissure in an igneous rock had been filled in by glacial beds. Shells were most numerous on the north side of the dock in Boulder-clay, associated with irregular sandy seams, the whole being softer than the general mass. The containing rock was not glaciated at this point. Leda, Nucula, Cardium, Tellina, Mya, and Saxicava are the principal genera. There was great difference in the state of preservation according to position; the shells below the water-line being remarkably fresh, while acidulous waters engendered by vegetable decay had attacked the upper portions. The author concludes that the whole mass of drift, including the shells, had been pushed up by ice in its passage southwards.

The general mode of occurrence was very similar to that at Bridlington. He further observed that the rocks were not striated in the first instance by these shelly clays, but he believed the glaciation to have taken place through the action of harder substances, and that afterwards a milder term set in, when an Arctic fauna established itself in the neighbourhood, after which fresh ice pushed the sea-bottom along with other accumulations into its present position. The shell-beds in the Fraser Valley are about 100 feet above sea-level. Three sections of glacial beds were given. The stratified clay in which the shells were found contains no pebbles, and, though somewhat disturbed, has evidently been deposited where it now occurs.—On a lower jaw of Machærodus from the "Forest-Bed," Kessingland, by James Backhouse, F.G.S.—A contribution to the history of the Cetacea of the Norfolk "Forest-Bed," by E. Tulley Newton, F.G.S.

EDINBURGH

Scottish Meteorological Society, March 29.—Half-yearly Meeting.—Mr. John Murray read the Council's report, which stated that since last July the only change that had taken place in the Society's stations was the loss of the station at Sandwick, in Orkney, and the establishment of a new station in the neighbourhood, at Swanbister. The three Members of Council who retired by rotation were Dr. J. B. Russell, Glasgow; Dr. J. D. Marwick, Town Clerk, Glasgow; and Prof. Alexander Dickson; and their re-election was recommended. In July last the membership of the Society was 698; it was now 712. In addition to the inspection of stations and the ordinary work of the Office, the Secretary had been engaged with the discussion of the Ben Nevis observations, and the work was now far advanced. Some time had also been given to the preparation of a fourth paper on the climate of the British Isles, dealing with the mean monthly distribution of the rainfall, based on the twenty years from 1866 to 1885. Mr. Omond was also engaged in the discussion of the Ben Nevis observations. During the summer and autumn the Observatory on the Ben had been utilised by Mr. H. N. Dickson for hygrometric observations; and Prof. Vernon-Harcourt and Mr. Harold Dickson, both of Oxford, had also spent some time at the Observatory in August conducting experiments and observations on the intensity of light in flames. The researches at the Scottish Marine Station were being prosecuted with vigour and success. Messrs. Mill and Morrison were engaged in collecting and tabulating all the observations which had been made around the coasts, and combining them with those made by the observers in connection with the Marine Station, the object being to obtain a more exact statement of the temperature conditions of the sea around the coast at different months of the year and at different depths. Observations had also been continued on the Firth of Forth by these gentlemen with very interesting results. It was shown by Mr. Mill on a former occasion that the winter condition of the Firth was one of uniformly-rising temperature from the river to the sea, and from the surface of the water to the bottom; while the summer condition was one of uniformly-falling temperature from river to sea, and from surface to bottom. The winter condition commenced in September 1885, nearly two months earlier than in 1884; the temperature of the water had been everywhere lower than in the winter of 1884-85, and at the present date there was no sign of the transition to the summer state. Two gentlemen in the north had been observing the temperature of the River Thurso at the mouth, and at a point twelve miles inland. The river, it is shown, responded rapidly to changes of temperature. During the greater part of the winter the water kept close to the freezing-point, though never actually freezing, except at the margin; while the sea had been uniformly from 10° to 5° warmer than the river, and its temperature had never been below 40°.—The Treasurer, Dr. Sanderson, stated that a member, who did not wish his name disclosed, had given 100*l.* to be distributed—50*l.* to Mr. Omond, 30*l.* to Mr. Rankin, and 20*l.* to Mr. Miller. The donation was "in acknowledgment of their services in the important work in which they were engaged, from an admirer of their indomitable pluck."—An interesting paper by Mr. Omond was read on the rainfall and winds at Ben Nevis Observatory. The winds, arranged in order of greatest frequency, are N., S.W., W., S.E., S, N.E., N.W., and E.,—the N.E. and E. winds being remarkably few in number. In their relation to the rainfall, the order of the winds for wetness is W., N.W., S.W., N., S., N.E., S.E., and E. The direction from which most rain came during 1885 was probably a little to the north of west, and the quantity diminishes as we go round the compass in both directions, until the driest point is reached a little to the south of east, the east winds having thus a very low figure both as regards frequency and the quantity of rain precipitated by them. Again, arranging the data for the amount of rainfall per 100 hours of each wind, the following is the order: N.W., W., S.W., S., N., N.E., S.E., and E.,—the E. and S.E. winds being very dry. With a falling barometer the average daily rainfall amounted to 0·587 inch, while with a rising barometer it was 0·483 inch.—The next paper was on rain-band observations on Ben Nevis, by Mr. Rankin, first assistant at the Observatory. The observations have been made on a scale of 0 to 5, and the mean results of the rainfall for three and twelve hours respectively after the observations showed that the rainfall increased steadily in amount with the figures of the scale. Grouping the observations according to season, it is shown that the subsequent rainfall was less with a higher, and greater with a lower, temperature. Very interesting observations were referred to, which were made in those states of the atmosphere, of no infrequent occurrence on the Ben, when aërial strata of great dryness and of complete saturation are superimposed on each other.—In a paper on the recent literature of the rain-band, Mr. H. R. Mill remarked that, although the spectroscope had been shown by many observers to give 80 per cent. of rain or of no rain occurring in a given time, results of great scientific value could only be expected when, as at Ben Nevis Observatory, it was combined with a complete series of hourly meteorological observations.—Mr. Buchan gave, in reference to the weather of the past winter, a short analysis of the temperature of Scotland during the past 122 years. During this long period the last 15 years showed the coldest 15 consecutive summers. Each of the 15 Junes was below its average temperature, except June 1873, which was 0°·2 above it. The mean of the Mays was 1°·6 under the average; the Junes 1°·2; and each of the other months from April to December from 0°·4 to 0°·9 under the average. The means for January, February, and March were above the average. During these 122 years there had occurred 38 hard winters, extending from two to six months each. Of these 38 winters 18 were followed by good summers and 20 by bad summers, and while of the 18 good summers 2 may be classed, in respect of the temperature, as very good, 8 of the 20 bad summers were very bad, and proved most disastrous to the grain crops.

PARIS

Academy of Sciences, April 19.—M. Jurien de la Gravière, President, in the chair.—Note on some new methods for determining directly the absolute value of refraction at various degrees of altitude, by M. Lœwy. After brief reference to the ordinary methods, including one recently proposed by the author himself, the paper goes on to explain a new process by means of which the refraction may be directly determined at all degrees of altitude,—an operation hitherto supposed to be impossible. It concludes with the description of a method for immediately ascertaining the effect of temperature and barometric pressure on refraction.—On the diurnal variation in direction and intensity of the magnetic force in the horizontal plane at Greenwich, as deduced from Sir G. B. Airy's observations made during the years 1841-76, by M. Faye. The author deals with the important series of diagrams appended by the Astronomer-Royal to the volume of Greenwich Observations for 1884, embodying the diurnal variations in horizontal direction and intensity of the terrestrial magnetic force for the thirty-six years ending in 1876 inclusive. As a general result it would appear that the magnetic curves, as exhibited in the 430 diagrams of Sir G. B. Airy's series, contract and expand periodically in direct agreement with the greater or less prevalence of the solar spots, and also with great regularity according to the seasons, the summer curves being invariably far greater than those of winter.—On the remains of fossil reptiles discovered by M. Fritsch in the Permian formations of Bohemia, by M. Albert Gaudry. These fossils, now collected in the Palæontological Museum of Prague, are grouped in twelve genera representing a whole series of quadrupeds of a comparatively high order, obtained in strata where, till lately, no animals had been found higher than the order of fishes. Compared with those of the Secondary epoch, all these Primary reptiles are of small size and imperfect development, inferior in these respects to the Actinoderm, Enchirosaurus, and Stereorachis found in the

bituminous schists and other formations of corresponding age in France.—On the fluorescence of the earths provisionally named Zα and Zβ, by M. Lecoq de Boisbaudran. In opposition to the views of Mr. Crookes, the author endeavours to show that these are really two distinct earths, not one substance identical with Mr. Crookes' Yt_2O_3, whose different fluorescent bands become diversely modified by the presence of foreign bodies.—On M. Marignac's earth Yα, by M. Lecoq de Boisbaudran. At the author's suggestion, M. Marignac, discoverer of this rare earth, has at last definitely named it *gadolinium* (symbol Gd).—A second note on the origin of the electric discharge of thunder-clouds, by M. Daniel Colladon. A remarkable coincidence is pointed out between the author's observations and some electric phenomena observed at the same time near Shrewsbury, and reported in the *Monthly Meteorological Magazine* for September 1885.—On a mathematical essay by Prof. Battaglini, presented to the Academy by M. de Jonquieres. This is a reprint from the *Giornale di Matematiche*, containing a demonstration of the theory of Cremona transformations, with some fresh developments of the same theory.—On the blight known as *taches nécrosées*, which attacks the peach-trees in the fruit gardens of Montreuil and other districts near Paris, by M. Prillieux. The cause of this local disease is traced to a parasite of the order Coryneum. Solutions of salts of copper or diluted sulphuric acid are proposed as remedies.—On the results of direct astronomic observation compared with those obtained from MM. Henry's photographic system, by M. Flammarion. The discrepancies between M. Wolf's chart and MM. Henry's photographs are attributed to errors of observation on the part of M. Wolf, and the author concludes that the photographic record is far more accurate and altogether more trustworthy than direct observation. The ten stars marked on M. Wolf's chart, but which do not appear on the photographs, are stated to have no existence in the firmament.—On the reduction of the Abelian integrals, by M. H. Poincaré.—Theorem on the binary forms, by M. d'Ocagne.—On the thermo-electric properties of the iodide of silver, by M. H. Le Chatelier.—Note on the vanadates of ammonia, by M. A. Ditte. The paper deals with neutral vanadate, bivanadate, yellow and red trivanadate, and other combinations formed by ammonia and vanadic acid.—Transformation of the protochloride of chromium into a sesquichloride: mechanism of the dissolution of the sesquichloride of anhydrous chromium, by M. Recoura.—On the acid fermentation of glucose, by M. Boutroux. The cause of fermentation is traced to a micrococcus greatly resembling the organism already described by the author under the name of *Micrococcus oblongus*.—A further survey of the vegetation of South Tonquin, by MM. Ed. Bureau and A. Franchet. The paper deals with a collection made in the hilly district south-west of the Song-Koi delta, by the Abbé Bon, and presented to the Paris Natural History Museum by the Abbé Hy. It comprises 857 species grouped in 124 families, and tends to confirm the impression that the flora of Tonquin has no special features, but forms a transition between those of China and India.—A new example of alternating generations in the fungus family (*Cronartium asclepiadeum* and *Peridermium Pini corticolum*), by M. Max. Cornu.—On the acrogenous development of the reproductive bodies in the fungus family, by J. de Seynes.—On the theory of earthquakes, by M. Stanislas Meunier. A number of fresh observations are advanced in support of the author's view that underground disturbances and eruptions are primarily due to the infiltration of surface-waters.—On the geology of East Tonquin, by M. E. Jourdy. From a protracted study of this region the author infers that in the interior the Carboniferous underlies the Triassic formation, while on the coast the Coal-Measures, here of infra-Liassic age, rest directly on the Carboniferous limestone in one of its folds.—On the disappearance of the nuclear chromatic elements and progressive appearance of the chromatic elements in the equatorial zone, by M. Ch. Degagny.—On the mycosic nature of tuberculosis, and on the bacillary evolution of its pathogenic fungus, *Microsporon furfur*, by MM. Duguet and J. Héricourt.

BERLIN

Physiological Society, February 12.—Dr. Müllenhoff informed the Society that a treatise of the great astronomer Kepler had quite recently come under his notice, containing, under the title of "Neujahrsgeschenk, oder der sechsstrahlige Stern des Schnees" ("New Year's Present, or the Six-rayed Snow-Star"), a very clear and accurate description of the structure of the bee's cell. Kepler described the bee's cell as a rhombendodecahedron in which one trihedral pyramid was replaced by a straight terminal surface. The speaker further set forth the observations he had made on the way in which bees filled and preserved in their cells honey and pollen. The bee, which, according to the most recent determinations of Dr. Loew in the Botanical Gardens of Berlin, was able to force its way into most flowers, having first completely filled its capacious honey-stomach, crept into the cell, and, with its tongue, licked a small spot of the posterior uppermost edge many times, and on this spot, so moistened, it deposited a honey-drop. On this honey-drop other bees next discharged their honey till the whole cell was filled with the viscid liquid. Eight bees sufficed to fill one cell. Each deposited honey-mass got covered with a kind of pellicle that at a small spot was bitten through by the next succeeding bee, which then laid its honey at this opening, the honey penetrating into the interior. The filled cell was closed with a wax lid. The pollen brushed off the blossoms by the bees was, by admixture of a little honey or water, converted into a dough-like substance, and pressed into cells intended only for working bees till they were half filled. The rest of the cells were then filled with honey in the same manner as were the pure honey-cells. Finally these too were closed. When the cell was filled either with honey or with pollen-dough and honey, a drop of formic acid secreted from the poison-gland was infused through the lid by means of the sting. This formic acid, as had been proved by numerous experiments, preserved the honey, as also every other solution of sugar, from fermentation. Indeed formic acid in the proportion of 1/10 per cent. was altogether a very good preservative. Pollen, which was not covered with honey, got very soon mouldy.—Dr. Benda made further communications respecting spermatogenesis, first premising that the observations of his own which he communicated at the last meeting (*vide* NATURE, February 11, p. 360) had been published some months prior to that date by an English investigator, Herbert Brown. The similarity between the drawings of Mr. Brown and his own was striking. If he had thus been forestalled in the discovery of the new facts by his English contemporary, he had yet been able to observe a series of further details beyond the limit of what had hitherto been ascertained, several of which he communicated.—Dr. Gad had been engaged for a number of years in experiments on respiration, and both in those experiments carried out by himself and in those executed by his students he had obtained the same results. The problem was to establish whether the centres situated in the medulla oblongata and above it in the brain automatically discharged the movement of inspiration and expiration or only stimulated one group of respiratory muscles, actions which were to be characterised as normal excitations due to automatic activity and proceeding from the blood, not operating in a reflex manner. These centres were usually called automatic, but in the opinion of the speaker they would be more correctly described as autochthonous, seeing they were excited only at the particular place and spot, and not set in motion by any stimulus derived from the outside. To study the normal activity of these centres Dr. Gad examined the respiratory processes in the primary stage of dyspnœa, when the medulla oblongata was ill-supplied with air. The bad ventilation was brought about either by the animals having breathed the air so long that they were obliged to inhale air that was now grown vitiated, or having to breathe a mixture of nitrogen with less oxygen than was contained in atmospheric air, or a mixture of atmospheric air with carbonic acid; or the normal exchange of gas was restricted by tracheostenosis, or by heavy bleedings, or by the Kussmaul-Tenner experiment, in which, as was known, the flow of arterial blood to the brain was dammed off. In all the cases above enumerated, only augmented inspiration was always observed—never increased expiration. In the Kussmaul-Tenner experiment a lassitude of the inspiration set in very soon before the spasms had yet begun, a circumstance which called forth the appearance of an enhanced expiration. The method adopted in these experiments was considered by the speaker unobjectionable. Into the trachea of the rabbits there was fixed a cannula, which, by means of a double-direction tap, might be connected with the outer air or with very large gas repositories. The animal found itself in a small closed air-proof box communicating with a small, shallow box, the upper lid of which consisted of a movable mica plate, with recording lever. Each inspiration of the animal raised the lid, and consequently the recording lever, which marked on a rotating drum the curve of

respiration. At each expiration the lid sank with the pen. Dr. Gad concluded from his experiments that, by bad ventilation of the respiratory centres automatic or autochthonous expiration could never be induced, but always inspiration alone. Dr. Gad further endeavoured to ascertain what was the limit of deficiency of oxygen and of carbonic acid admixture under which the first traces of dyspnœa showed themselves, and found that the animals were more sensitive to the excess of carbonic acid than to the deficiency of oxygen. An addition of 3 per cent. CO_2 was sufficient to excite dyspnœically augmented inspiration, while they could very well stand an air of 18 per cent. oxygen. The quantities of CO_2 which were mixed with the respiratory air were increased to 26 per cent. without the result being other than increased inspiration. Regarding the several series of experiments and their results, Dr. Gad would communicate a more special report at a subsequent meeting.

Meteorological Society, March 2.—Dr. Weinstein spoke on the earth's currents which were observable in the telegraph wires by the disturbances they caused in the message service, their intensity at times exceeding that of the batteries of eighty Daniell employed for telegraphing. In order to the observation of the earth's currents, two equal metal plates had since the time of Faraday been sunk into the ground and connected by a wire, in which a galvanometer was intercalated. The deviations of the galvanometer needle might be induced as well by an earth-current as by a current which arose from the contact of the earth-plates with the earth. In the latter case, however, the current would be very weak when the plates were at a great distance from each other. The case being, in point of fact, otherwise, however, the currents in question were accordingly earth-currents. The measurement of them was achieved by means of self-registering apparatus, either in the way of photography in England or mechanically in Germany; the earth-current was conducted through a coil, that, suspended in the interval between a rod magnet and a hollow cylinder magnet, was, under the oscillations of the current, drawn in or pushed out, and, by means of a lever, inscribed these movements on soot-blackened paper. The direction of the current in the body of the earth was found by observation of two circuits forming a right angle with each other. In Berlin one circuit proceeded eastwards towards Thorn, the other southwards towards Dresden. The observations made in Berlin showed a direction of the earth's current from north-east to south-west, while in England the direction went more from north to south with a slight deviation towards the east, and in France a direction from north to south with an inclination towards the west was observed. The earth-current showed a perfectly regular daily variation. In the night the earth-current is slight; from 8 o'clock in the morning it regularly increases, attains its maximum precisely at 12 noon, thence sinks rapidly till 4 p.m., whence it continues uniformly weak, not to revive till the following morning. A course precisely analogous to that of the earth-current was manifested by the earth's magnetism, the connection of which with the electricity of the earth attracted attention from the very beginning, when disturbances made themselves observable. To demonstrate with perfect precision the coincidence of the two phenomena it was necessary to take for the purpose of comparison not a single earth-magnetic element, but the earth's total magnetism. The earth's electricity and the earth's magnetism showed, moreover, in their regular daily course, their affinity, by the simultaneity with which their disturbances occurred. This simultaneity was so precise that in one case the distance between Berlin and Wilhelmshaven could be determined from the time when the disturbance of the earth's current made itself felt in Berlin and the time when the magnetic disturbance occurred in Wilhelmshaven. This simultaneity of disturbances at distant points of the earth pointed to a cosmical cause. Thus in August last year, at the very time when in Paris the emergence of an altogether unusual solar protuberance was observed, a magnetic disturbance was registered in Petersburg, and a disturbance of the earth's current in Berlin. The earth's current and the earth's magnetism showed further in common the periods of eleven years which coincided with those of the solar spots. In respect of the earth's current, this period could not indeed be demonstrated to a certainty, seeing that the regular observations made respecting it were yet of too recent date; but the regular course of the oscillations warranted the conclusion of a like period being drawn. A period of from two to five days in which the earth's current and the earth's magnetism showed in their oscillations alternately larger and smaller amplitudes had, in addition, been detected, although the explanation of the phenomenon was not yet forthcoming. With reference to the question which phenomenon was the primary, the earth's current or the earth's magnetism, opposite views were entertained. The earth's electricity was assuredly not strong enough to magnetise the body of the earth; but, *on the other hand, against the assumption that the earth's* currents were induced by the oscillations of the earth's magnetism an objection might be raised, namely, that in such a case the earth's currents would have to be proportional to the velocities of the oscillations of the earth's magnetism, and not to the oscillations themselves. This question can only be decided by further observations and by experiment. In a wide circle out of telegraph circuits the induction effects of the earth's magnetism might be studied and compared with the earth's currents. The speaker discussed the different theories of the earth's electricity set forth by Faraday, De la Rive, Lamont, Edlund, and the Brothers William and Werner Siemens, without declaring himself decidedly in favour of any of them. In conclusion he drew attention to the series of different jerks which showed themselves in the self-registering curve of the earth's currents on the occasion of every thunderstorm. A jerk of this description on the part of the pointer seemed to correspond with each lightning-flash.

BOOKS AND PAMPHLETS RECEIVED

"Memoirs of the Geological Survey of India": "Palæontologia Indica," Ser. xiii. "Salt-Range Fossils, (i.) Productive-Limestone Fossils; (5) Bryozoa-Annelida-Echinodermata" (with Plates lxxxvii.-xcvi., by W. Waagen (Trübner).—"Quarterly Journal of the Microscopical Society," April (Churchill).—"Malvern, its Ferns, &c.," by G. E. Mackie (*Malvern Advertiser*).—"Sacred Books of the East," edited by F. Max Müller, vol. xxvi. "Satapatha Brâhmana," part 2, books iii. and iv., by J. Eggeling (Clarendon Press); vols. xxvii., xxviii., "The Li-Ki," by J. Legge.—"Annales de l'Observatoire de Moscou," vol. i. part 1, 1886 (Lang, Moscou).—"British Fungi," vol. i., by Rev. J. Stevenson (Blackwood).—The Naturalist's Diary," by C. Roberts (Sonnenschein).

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